

Request for Proposal

Using Virtual Reality to Evaluate Medication Room Design

1. Introduction

The Health Quality Council of Alberta (HQCA) is a provincial agency that pursues opportunities to improve patient safety and health service quality for Albertans. We gather and analyze healthcare system information, monitor the performance of the healthcare system, and collaborate with Alberta Health, Alberta Health Services, health professions, academia, and other stakeholders to translate that knowledge into practical improvements to health service quality and patient safety. The HQCA is legislated under the *Health Quality Council of Alberta Act*.

The HQCA has recently released the *Simulation-based Mock-up Evaluation Framework* (www.hqca.ca/humanfactors) which outlines an approach to test design before construction of a healthcare facility and highlights different physical mock-up fidelities which can be used. The framework is currently being integrated into provincial and national healthcare facility design standards and guidelines. Little evidence exists outlining what types of latent conditions or hazards are more likely to be identified depending on which mock-up fidelity is used. Although the framework does not specifically identify virtual reality (VR) as being applicable to create a mock-up, VR environments have potential to provide some distinct advantages over physical mock-ups, such as cost efficiencies and increased interaction capabilities earlier in the design process.

The HQCA is recruiting a vendor to develop a VR environment of a medication room. This VR environment will allow up to four people to interact with each other and the VR environment simultaneously, allowing for data collection and analysis that can be used to optimize the medication room design.

2. Project description:

2.1. This project will evaluate a medication room (see Appendix A: Medication Room Floor Plan) using the Simulation Based Mock-up Evaluation Framework. Three mock-ups, differing in fidelity (degree to which a mock-up is completed), will be used for the evaluation over three phases of the project:

- PHASE 1: Simple mock-up - tape / cardboard boxes indicate walls / cabinets.
- PHASE 2: Detailed mock-up - plywood or real cabinets used to construct walls and furnish the room.
- PHASE 3: VR mock-up - immersed in a virtual environment.

2.2. Findings from this project will be used to develop evidence-based guidelines outlining which mock-up fidelity should be used to optimize cost effectiveness (including

financial and human resources) as well as outcomes (identified latent conditions, hazards, etc.) in the design process.

2.3. This request for quotation is specific to the evaluation of a VR mock-up only.

3. Background and context

3.1. The same evaluation process and scenarios used to evaluate the VR mock-up will also be used to evaluate simple and detailed physical mock-ups during other phases of this project to allow for comparison between the three mock-up options.

3.2. Findings from the project, including this VR mock-up phase, will be publically available and used to (1) promote the use of simulation-based mock-up evaluations during healthcare facility design and (2) promote the use of appropriate mock-ups (simple, detailed, or VR) as per the learnings from this project.

3.3. The HQCA has limited experience using VR hardware or software, but the project lead has extensive experience conducting simulation-based mock-up evaluations using physical mock-ups.

3.4. In addition to the floor plans included within this request for quotation, a .dwg file of the medication room floor plan and elevations is available to assist in developing the VR environment.

3.5. Participants and physical space for the simulation will be obtained by the HQCA.

4. Key activities and deliverables

All proposals must include responses to the following key activities and deliverables which will be used in selecting the successful bidder. The vendor must provide the following:

4.1. Create VR environments for two medication room configurations with a patient charting area as shown in Appendices A and C. See Appendix B for photos of the built medication room.

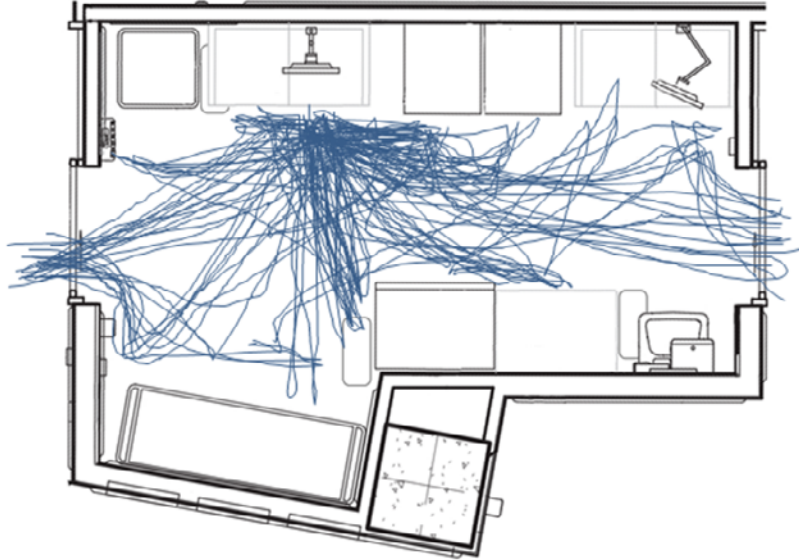
4.2. Include two types of mobile carts which can enter, exit, and be moved around the medication room (see Appendix D).

4.3. The VR environments must allow for scenario enactments with up to four people who will interact with each other and the VR environment simultaneously.

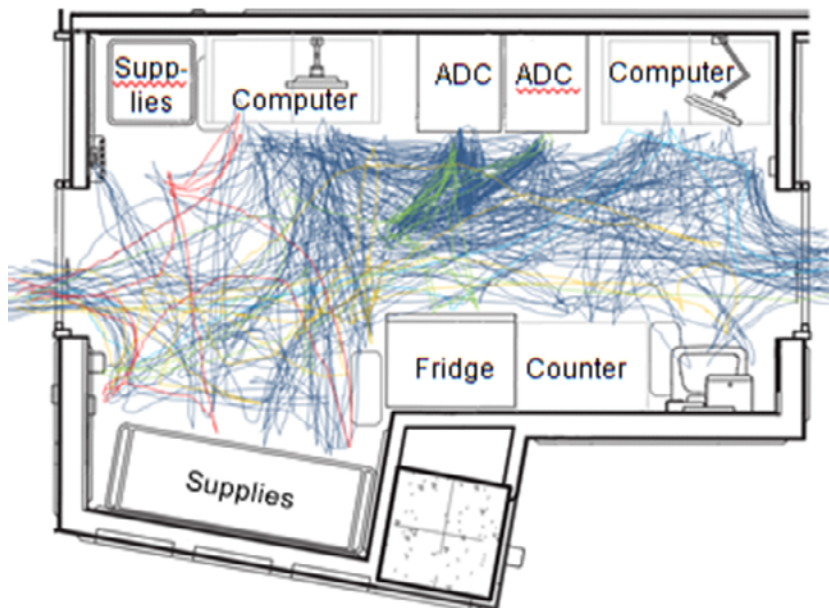
4.4. Appendix E outlines a draft version of one sample simulation scenario describing how these people will interact with the VR environment. The VR environment must allow the enactment of this and other scenarios. Additional scenarios (likely 4 or 5 scenarios in total) of varying complexity will be developed. The sample scenario is anticipated to represent one of the more complex scenarios because it includes the maximum number of people in the room and requires interacting with most of the medication room.

- 4.5. Be on-site in Calgary, Alberta, Canada to set-up and record the scenarios enactments within the VR environment, and also to provide training / demos of the VR environment. This is anticipated to include five consecutive business days: one day of set-up, one day of demos, and three days of scenario enactments.
- 4.6. Provide recordings of the scenario enactments in a way that will support or allow for data coding and analysis described below. Data coding / analysis should be automated where feasibly possible. Please indicate which data analysis components will be coded and/or analyzed through vendor supplied software. The remaining data coding / analysis which is not automated will be coded / analyzed by the HQCA. Data analysis will include:
 - 4.6.1. **Behavioral coding:** Each of the following observations during the scenario enactments will be coded:
 - 4.6.1.1. **Entry / exit times** – recoding what time each person enters and exits the room.
 - 4.6.1.2. **Bumps** – physical contact between two objects (people and/or equipment) that were not intended to make contact.
 - 4.6.1.3. **Access issues** – equipment / supply needed that is not easily accessible.
 - 4.6.1.4. **Congestion** – an object (person or equipment) is in the way.
 - 4.6.1.5. **Excessive reaches** - accessing something beyond one's 'reach envelope', which is the length of an extended arm.
 - 4.6.1.6. **Searching** – the location of a supply or equipment is unknown to an individual needing it.
 - 4.6.1.7. **Distractions** – potentially prevents someone from giving their full attention.
 - 4.6.1.8. **Interruptions** – captures person attention while they are in the middle of another task.

4.6.2.Link analysis: Illustrates where each person moves within the VR environment. This data will need to be displayed in a way that is specific to one person for one scenario. For example:



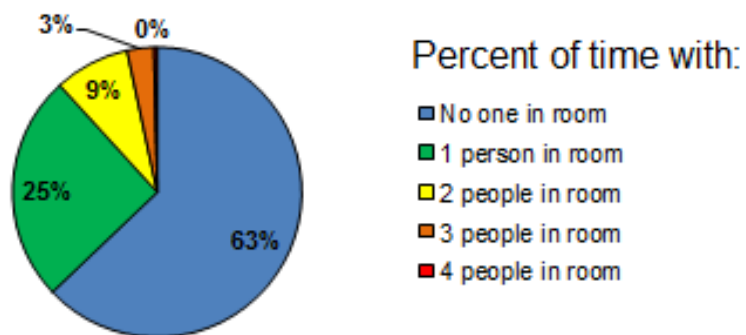
Multiple link analyses will also need to be color coded and combined to illustrate movement of all individuals within or across scenarios. For example:



4.6.3. **Bump analysis** – Illustrates the location where each bump (as defined above) occurred. For example:



4.6.4. **Room occupancy** – Total amount of time during the each scenario when the room has 1, 2, 3, and 4 people in the room. For example:



5. Project Timeline

Preferred schedule is outlined below. If the schedule below is not possible, vendor to provide an alternate timeline with supporting rationale.

Activity	Deadline
Develop VR environment	Nov – Dec, 2016
Scenario enactment (5 days on site in Calgary)	Jan – Feb, 2017
Provide automated data analysis	Feb – Mar, 2017
All work completed	March 31, 2017

6. Statement of Ownership

All recordings of the scenario enactments created under this activity will be the exclusive property of the HQCA.

7. Requirements for quotation

Although not limited or restricted to, all proposals must include the following elements which will be used in selecting the successful bidder:

- 7.1. Indication that the objectives of the project are understood and met.
- 7.2. Described capability to provide full scope of service required as per section 4.
- 7.3. Proposed approach, including recognition of any difficulties associated with the project, and plans to address such difficulties.
- 7.4. Experience and capability of personnel involved in the project, with their roles in the project clearly defined.
- 7.5. Specify space requirements and any other requirements of the HQCA to allow for scenario enactments.
- 7.6. For each item listed under section 4 (key activities and deliverables), indicate and comment on your ability to comply with each of the following:
 - 7.6.1. Regarding section 4.4, describe what level of detail will be incorporated into the VR environments to accommodate the sample scenario in Appendix E.
 - 7.6.2. Regarding section 4.5, indicate availability in January and February of 2017 to be on-site in Calgary for 5 consecutive days.
 - 7.6.3. For each sub-point listed under section 4.6 (data analysis), specify if the data coding / analysis will be automated through vendor software (and is included in the total quoted cost), or if it will be manually coded / analyzed by the

HQCA. Also include a description of what will be supplied to and/or required from the HQCA for each.

- 7.7. List of tasks and associated hours, an hourly rate, anticipated expenses, and total cost for the project. This should also include an anticipated payment schedule with each fee item attached to a specific deliverable.
- 7.8. Proposed work schedule with consideration to the outlined schedule in section 5.
- 7.9. Previous project references.
- 7.10. Any other supporting document the bidder feels is relevant.

8. Proposal Process

While the HQCA has made every considerable effort to ensure that accurate information is contained in this RFP, the information contained in this RFP is supplied solely as a guideline for proponents. The information is not guaranteed or warranted to be accurate, nor is it necessarily comprehensive or exhaustive. Nothing in this RFP is intended to relieve proponents from forming their own opinions and conclusions in respect of the matters addressed in this RFP.

9. Proposal evaluation and response rules

- 9.1. All submissions shall be firm proposals and may not be withdrawn for a period of sixty (60) days following the last day to accept proposals.
- 9.2. Acceptance/Rejection of Responses:
 - 9.2.1. The HQCA reserves the right to cancel this RFP at any time and to reissue it for any reason without incurring liability and with no vendor having any claim against the HQCA as a consequence.
 - 9.2.2. The HQCA reserves the right to reject any or all proposals; the lowest fee proposal will not necessarily be awarded a contract. Only where two or more proposals offer work judged to be of equal value, quality, and reliability will cost be the determining factor.
 - 9.2.3. All vendors submitting proposals will be advised of the contract award.
- 9.3. Evaluation – the HQCA will establish a selection committee that will evaluate all proposals that are submitted by the deadline. Evaluation criteria will include vendor response to each sub-point under section 4 and section 7.
- 9.4. Any and all addenda to this proposal call will be issued in writing and sent to all firms having received documents from the HQCA prior to the closing deadline.
- 9.5. The selected vendor will be required to enter into a contract with the HQCA.
- 9.6. Closing of Proposal:
 - 9.6.1. Firms may not submit new price proposals after the specified deadline.
 - 9.6.2. Amendments to submitted proposals must be received in writing prior to the deadline date.

- 9.6.3. All addenda issued during the time of the Request, and in closing, the addenda will become part of the contract along with the response to the proposal.
- 9.7. Interviews – vendors may be required to attend an interview to discuss the responses to the Request for Proposal. The HQCA will notify the selected vendors for an interview if required.
- 9.8. Each proposal shall show the full legal name and business address of the vendor, including street address if it differs from the mailing address and shall be signed with the signature of the person/persons authorized to bind the vendor and shall be dated.
- 9.9. All costs/expenses will be the sole responsibility of the vendor submitting the proposal. Each response must be duly signed and sealed and will be deemed irrevocable for 60 days after the deadline date. Fax copies will not be accepted.
- 9.10. All proposals must be clearly marked “Request for Proposal for Using Virtual Reality to Evaluate Medication Room Design”.
- 9.11. Vendors must identify any terms and conditions of this Request with which they are unable to comply. It will be assumed that the vendor accepts all terms and conditions unless otherwise noted and that all terms and conditions will form part of the contract.

10. Confidential Information

- 10.1. Bidders must accept and acknowledge that, in connection with their performance of the work under any resulting contract, they may have access to certain information, data and materials that are confidential to the HQCA and which are identified as confidential or would be understood by the parties, exercising reasonable business judgment, to be confidential (“Confidential Information”). Bidders accept that they shall not use, except to perform their obligations under any resulting contract, any Confidential Information.
- 10.2. All proposals received are confidential and shall be treated as such. All documents submitted to the HQCA are subject to the protection and disclosure provisions of the Alberta Freedom of Information and Protection of Privacy Act (FOIPPA) and the Health Information Act (HIA). While these Acts allow a person a right of access to records in the HQCA’s custody or control, it also prohibits the HQCA from disclosing personal or business information where disclosure would be harmful to business interests or would be an unreasonable invasion of personal privacy. Applicants are encouraged to identify what portions of their submissions are confidential and what harm could reasonably be expected from its disclosure.

11. Professional Liability Insurance

The Vendor shall be responsible to carry professional liability insurance by way of Blanket Liability insurance for all team members assigned to the project. The amount required for the

professional liability insurance coverage shall not be less than \$2,000,000 and for a period of not less than one (1) year from completion of the project. The Vendor shall submit proof of the liability insurance coverage prior to finalization of the contract.

12. RFP Timeline

Anticipated schedule of the RFP process is as follows:

Activity	Deadline
RFP issued	September 15, 2016
Proposals due	October 10, 2016, 4:30 pm MST.
Analysis and evaluation of proposals	October 21, 2016
Successful respondent contacted	October 26, 2016
Contract signed with successful firm	November 4, 2016

Each firm will receive acknowledgement of receipt of their proposal via email.

13. Submission Requirements

Respondents are requested to submit one electronic copy of their proposal **no later than Tuesday, October 10, 2016 by 4:30 pm MST**. All submissions should include contact information (including email) and can be sent to:

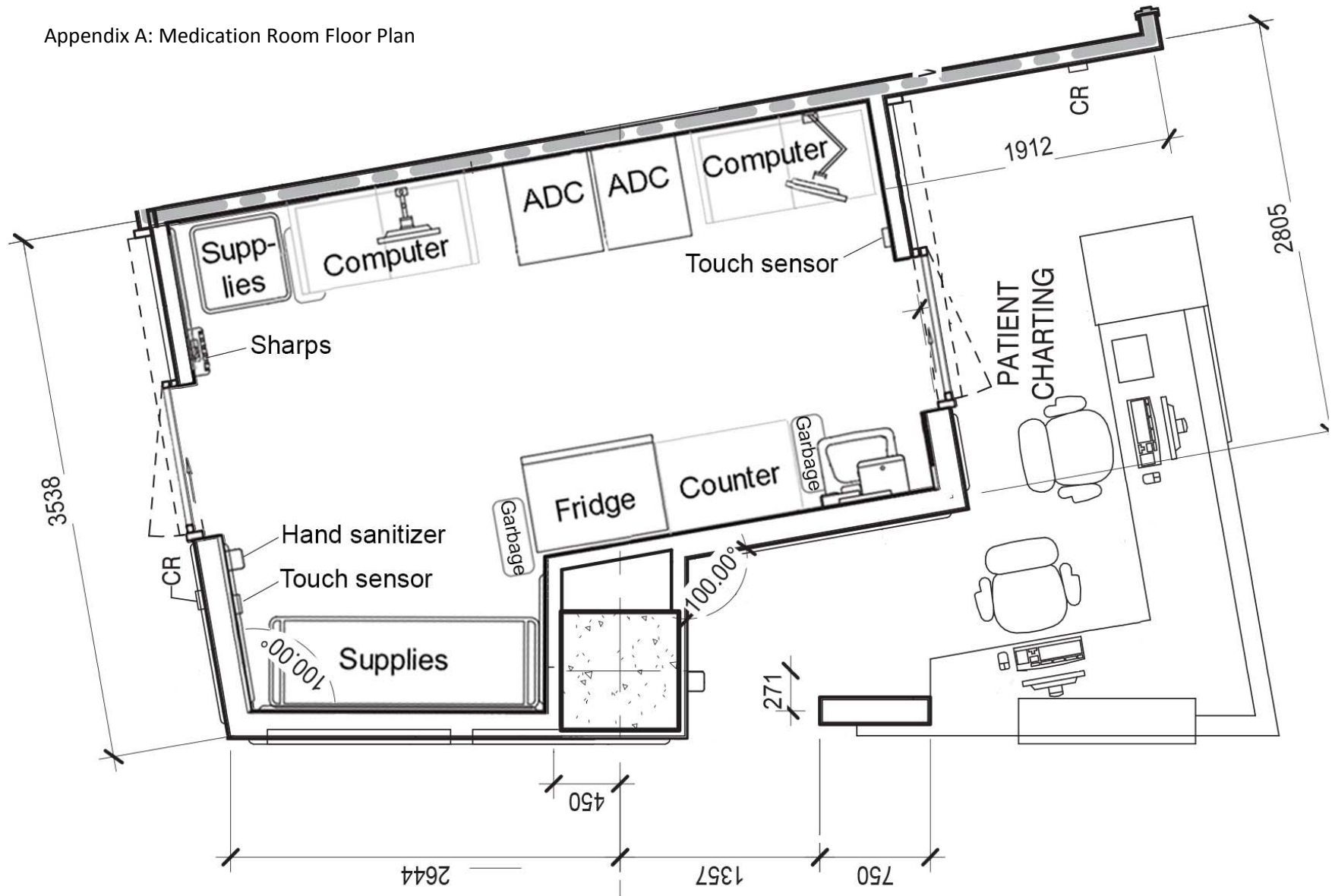
Jonas Shultz, Human Factors Specialist
jonas.shultz@hqca.ca

14. Questions Relating to the RFP

Any questions regarding the intent or content of this RFP should be directed to:

Jonas Shultz, Human Factors Specialist
jonas.shultz@hqca.ca
403-701-9749

Appendix A: Medication Room Floor Plan



Appendix B: Photos of built medication room.

Patient specific bins above
medprep area 1

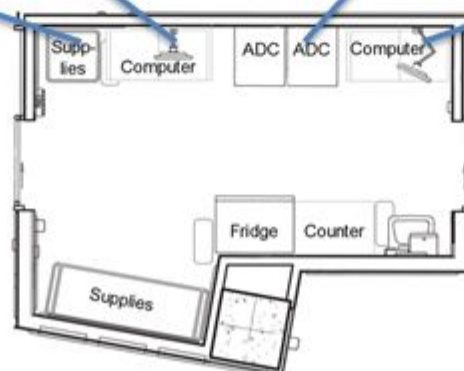


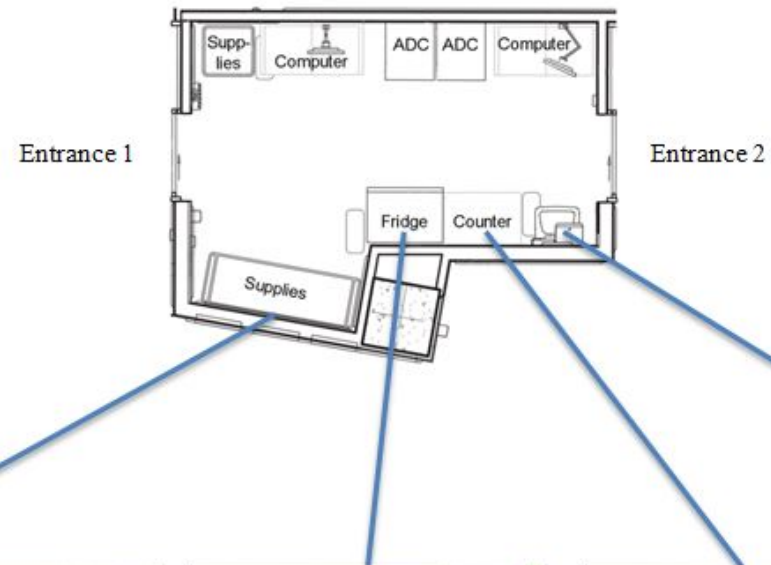
Patient specific bins above
medprep area 2



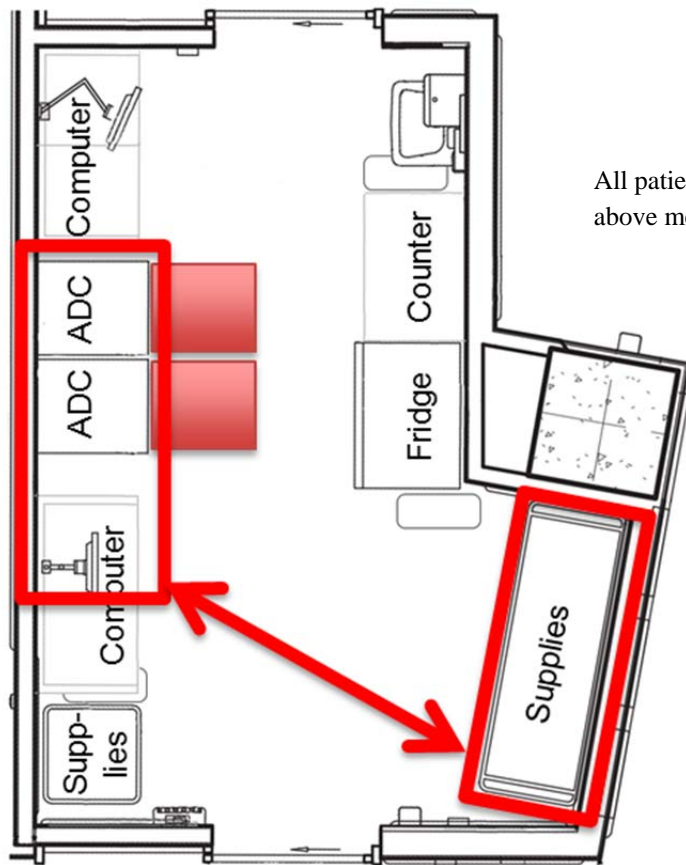
Entrance 1

Entrance 2



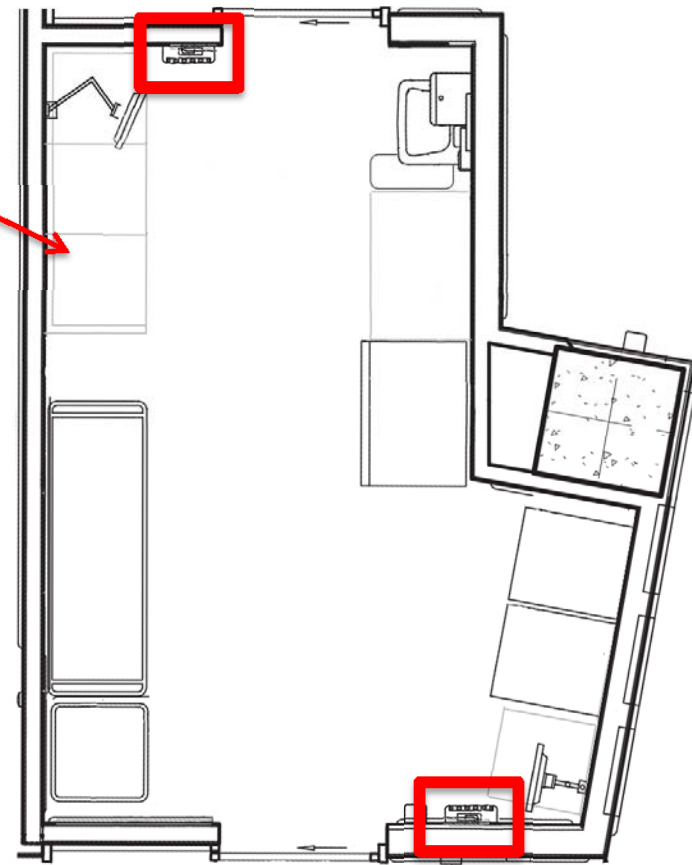


Appendix C: Alternate medication room layout



Layout 1: Same as Appendix A and B

All patient specific bins
above med prep area 2



Layout 2: Alternate layout with (1) ADC and counter space switched with ADC, (2) relocation and addition of sharps, (3) and co-locating patient specific bins.

Appendix D: Mobile carts



Wi-Med Cart



Pharmacy (Rx) Cart

Appendix E: Sample simulation scenarios

Scenario 1: Medication preparation following morning shift change.

Participants: Nurse 1 (RN1), Nurse 2 (RN2), Nurse 3 (RN3), Pharmacy Assistant 1 (Rx)

Scenario:

0:00:00 RN1 enters medication room from entrance 1 with a Wi-Med cart, and uses the hand sanitizer. RN1 gets 4 patient specific bin (2 bins from above med prep area 1, 2 bins from above med prep area 2). The four bins are placed onto the work surface of med prep area 1. RN1 uses the computer at med prep area 1 to identify which medications are needed for patient A, and then pull 4 different medications from the ADC and places them into the bins for patient A. Following the same, process RN1 pulls medications for patients B, C, and D, and placed them into the bins for each patient. [Most medications will be pulled from the ADC. Some medications will be pulled from the fridge.]

- *Patient A*
 - ASA EC TAB 81 mg
 - Furosemide 40 mg
 - Atorvastatin TAB 10 mg
 - Zopiclone TAB 5mg
- *Patient B*
 - Ramipril CAP 5 mg
 - Atorvastatin TAB 10 mg
 - Zopiclone TAB 5mg
 - Insulin (fridge)
- *Patient C*
 - ASA EC TAB 81 mg
 - Ampicillin INJ 2 g Powder/Vial
 - Docusate Sodium Oral LIQ 4 mg/ml, 25 mL
 - Zopiclone TAB 5mg
 - CIVA bag (fridge)
- *Patient D*
 - Potassium Chloride INJ 10 mmol/100mLPremix
 - Atorvastatin TAB 10 mg
 - Zopiclone TAB 5mg

The IV bags are prepared for administration [this involves getting supplies from the supply shelf and priming lines over the sink]. Then bins are then placed into the Wi-Med cart. RN1 uses the hand sanitizer and exits through entrance 1.

0:01:00 RN2 enters the medication room from entrance 2 with a Wi-Med cart, [NOTE: RN1 will still be preparing medications] and washes hands at the sink. RN2 gets 4 patient specific bin (2 bins from above med prep area 1, 2 bins from above med prep area 2). The four bins are placed onto the work surface of the Wi-Med cart. RN2 uses the computer on the Wi-Med cart to identify which medications are needed for patient E, and then pull 4 different medications from the ADC and places them into the bins for patient E. Following the same, process RN2 pulls medications for patients F, G, and H, and placed them into the bins for each patient. Most medications will be pulled from the ADC. Some medications will be pulled from the fridge. Then bins are then placed into the Wi-Med cart. RN2 exits through entrance 2.

0:02:00 Rx enters the medication room from entrance 2 with an Rx cart. Rx stocks medications from the Rx cart into the ADC, fridge, and supply cabinet. [medications to be stocked will be specified]. Rx exits the room through entrance 2 with Rx cart.

0:02:30 RN3 enters the medication room from entrance 1 without a Wi-Med cart, [NOTE: RN1&2 will still be preparing medications]. RN3 interrupts nurse using ADC to access a STAT medication from the ADC.

- *Patient I*
 - *Morphine INJ 2 mg/mL, 1 mL*

RN3 gathers needed supplies from supply cabinets, prepares syringe for administration work surface, and exits through entrance 1.